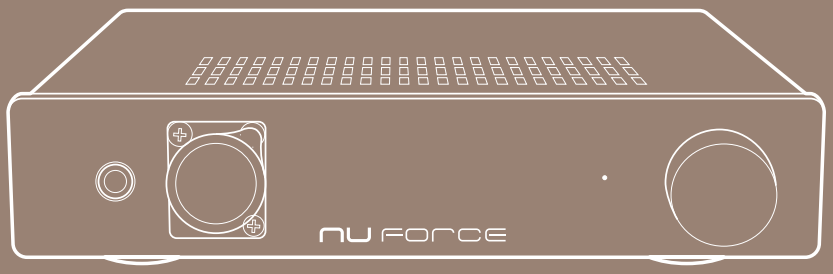
Optoma

nu FORCE

HA200

High performance headphone amp



User manual
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FCC Notice - Declaration of Conformity Information

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

WARNING: Only peripherals complying with the FCC class B limits may be attached to this equipment.

Changes or modifications made to this equipment, not expressly approved by us or parties authorized by us could void the user's authority to operate the equipment. This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

INTRODUCTION

The NuForce HA-200 is a high performance, Single Ended, Class-A Headphone Amplifier engineered to satisfy the requirements of the most devout headphone enthusiast.

As personal music listening and headphone use has become an ever-greater part of the audio market, the desire for uncompromised headphone amplification among devout enthusiasts has increased accordingly. The HA-200 was developed to specifically meet this need by uniting the most musically accurate technology available along with renowned NuForce value.

As an ultimate high-performance headphone amplifier, the HA-200 starts out with Class-A design and then combines that with a constant current output topology. Furthermore, when it is operated in classic Stereo Mode it also offers true Single-Ended (SE) output performance. As a valuable plus, two units can easily be combined to provide true Balanced Headphone Mode operation, which quadruples the available output power (2X voltage = 4X power) while increasing transient speed and dynamic control over the music.

Features

Class-A Topology

The Class-A topology is widely recognized as being the purest form of amplification, and this is because other topologies such as Class B and Class-AB require that two output devices be operated in "push-pull" fashion in order for each to handle one half of the musical waveform. At the point where a given device "hands off" to its opposing counterpart, it must "turn off" or stop conducting current until the waveform polarity ultimately returns to that which the device was assigned to handle. Then and only then will that device begin to conduct current again, while in turn, the opposing device must now stop conducting. This "sharing of polarity" behavior leads to what is commonly termed "crossover" or "notch" distortion.

Due to the battery-like type of charge storage within them and their inherent speed limitations, the transition between opposing output devices can never be perfectly aligned in time to produce a seamless flow of electrical current. Typically, a small discontinuity or "notch" at the zero-crossing (crossover) point can always be observed by an oscilloscope connected to the output terminals of the amplifier. This notch represents distortion and is of a static nature, meaning its amplitude remains the same at all signal levels. Therefore, this distortion represents an ever-increasing percentage of the total output as power levels are reduced, and contributes to a "grainy" sound that is particularly audible and quite irritating at low listening levels.

Conversely, in Class-A operation the output device is never completely shut off, so there is no "turn on" or "turn off"" time requirement, per se. Hence, there are no issues with charge storage or any ensuing crossover distortion. Class-A designs generally offer better high frequency performance and over-all feedback loop stability. This second point is especially important because all amplifiers produce some distortion, but compared to other topologies Class-A's superior feedback loop stability means that fewer high-order distortion harmonics are generated. The result is a more natural and harmonically accurate reproduction that is significantly less fatiguing.

Single-Ended (SE) Design

One unique advantage of Class-A design is the ability to employ only a single output device, with the technique commonly referred to as Single-Ended design. Quite simply, such a configuration guarantees that there is no opportunity for the generation of crossover distortion, and therefore is considered by many to be the purist form of amplification possible. The HA-200 operates in full SE Mode when used in its stock stereo configuration.

Balanced Headphone Mode

Unique to the HA-200 is its ability to quadruple output power by simply adding a second unit and operating them together in "Balanced Headphone Mode." For this configuration, all that's needed is to use the XLR inputs and outputs on each HA-200 along with a Balanced headphone cable available from your local or online Headphone Specialty Stores for connecting the headphones.

In Balanced Mode, four completely separate amps (2 per unit) are utilized to drive the four phases of the music signal (right normal, right inverted, left normal, left inverted). Please keep in mind though that this is NOT the same technique as mentioned above in the "push-pull" Class-B scenario. In Balanced Mode, all transistors are biased in Class-A so as to conduct current at all times – only the phase is inverted 180 degrees in the case of the left & right inverting amplifiers.

The primary benefit of such a design is that the available output voltage is doubled, so the actual output power is quadrupled. It also doubles the effective slew rate (the maximum change in voltage per second that an amplifier can achieve), as both amplifiers are operating in opposite phase to increase the dynamic realism of the music. While "technically" not a pure SE design, since Balanced Mode remains in full Class-A operation at all times it can be thought of as a "dual SE" architecture that retains the best of SE performance with the added benefits of higher power and better dynamic control.

Sonically, the resulting sound is completely "grain-free", the soundstage is wide and deep while instruments and voices are reproduced with extreme clarity and purity of tone. The incredible power and dynamic control over the music simply must be experienced to be appreciated.

Class-A's Modest Disadvantage

The one slight disadvantage that Class-A amplifiers have is that transistor bias current must be set such that the output transistor continually operates in the center of its "linear region", which simply speaking is the midpoint between its fully-on and fully-off limits. Therefore, regardless of the actual audio power being used Class-A amplifiers continuously consume their full-rated output power and dissipate that power in the form of waste heat.

Now in some cases this might be a serious efficiency issue, but mostly in those applications involving loudspeaker amplifiers capable of delivering several hundred watts of power. With headphone amplifiers, this is less of a concern due to their need for significantly less output capability. Nevertheless, while in operation the HA-200 will continuously consume 24W of power. In fact, that value actually exceeds the idle power consumption of a NuForce Reference 18 amplifier! The upshot is that in order to benefit from the superlative performance that the HA-200 has to offer, one must be willing to accept its somewhat lower power efficiency. In our opinion, that's a relatively small price to pay for such a great reward, and we believe that many will agree.

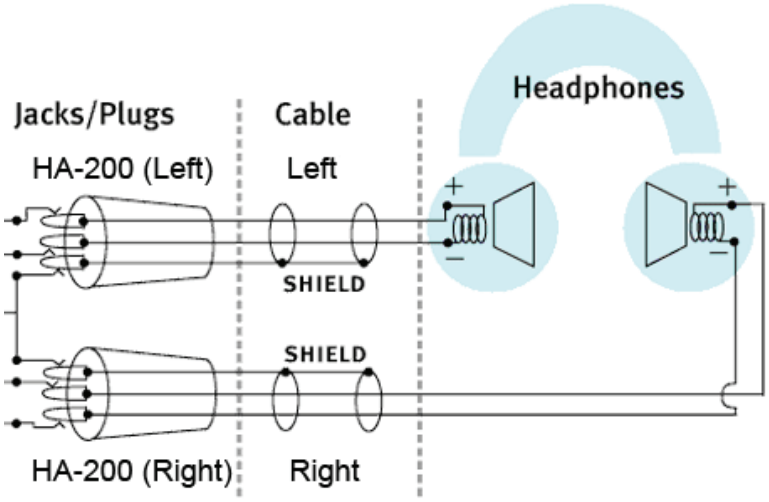
Constant Current Output

In addition to the Class-A, Single-Ended and Balanced Mode advantages, the HS-200's Constant Current output feature allows it to drive difficult headphone loads and/or headphones exhibiting erratic electrical impedance across the frequency spectrum. The Constant Current topology has the ability to constantly adjust output voltage as the headphone impedance changes with frequency – which is more common than not with most all headphones to some degree. Constant Current operation avoids the extreme performance and available volume variations that often plague other amplifier topologies, and ensures consistently good performance regardless of headphone type and/or impedance. Listeners that use differing types of headphones will greatly appreciate this feature.

Other HA-200 Features

- A single output gain stage (only 1 op-amp and 1 output device in the signal path)
- A high performance Alps volume control
- XLR connectors for operating in “Balanced Headphone Mode” (see above)
- A linear power supply comprised of a custom-made toroidal transformer and extensive capacitor reserves

To be sure, the HA-200 is not a headphone amplifier for the common man or woman. Developed specifically for the devout headphone enthusiast, it’s comprehensive design and pristine audio performance is reserved for those that demand nothing less than the very best.



In the ‘Balanced Headphone Mode’, simply use the XLR input (one on each HA-200) and output.

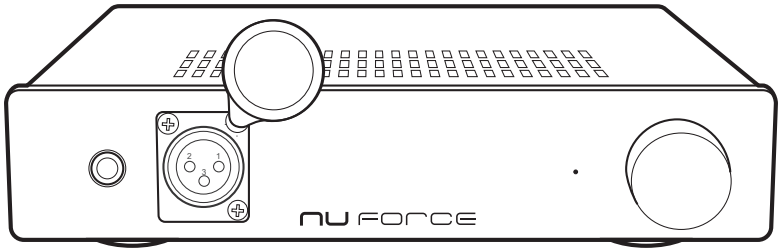
QUICK START GUIDE

WARNING!

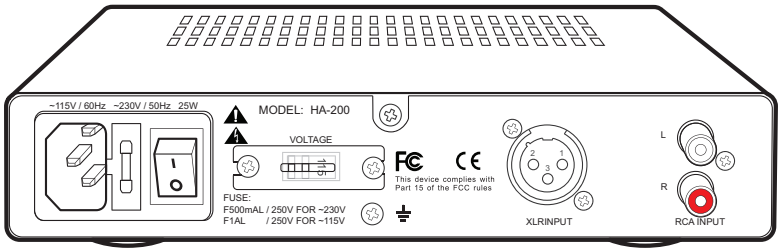
Do not connect your headphones to the XLR output when the RCA inputs are used. Use the XLR output only when you combine two HA-200 units in Balance Mode.

Product Overview

Front Panel



Back Panel



- To power on the unit, please turn on the rear AC switch

Connections

- Input:
  - 1 x XLR input
  - 1 x RCA input
- Output:
  - 1 x XLR output
  - 1 x 6.3mm headphone output

Note:

- *Headphones/earphones differ greatly in their impedance and efficiency. For safety, please make sure that the volume knob is adjusted to the lowest position setting before plugging your headphones/earphones into the 6.3mm headphone output. Then to avoid damage, gradually increase the volume to your desired listening level.*

SPECIFICATIONS

Frequency Response	10 – 20K Hz
THD+N	0.0005%
Rated Power Output	393mW @ 16 ohm 747mW @ 32 ohm 383mW @ 100 ohm 129mW @ 300 ohm 70mW @ 600 ohm
Max Power Output (Normal stereo, non-balanced mode)	600mW @ 16 ohm 937mW @ 32 ohm 530mW @ 100 ohm 180mW @ 300 ohm 96.3mW @ 600 ohm
SNR	> 116 dB
Dimensions (Depth x Width x Height)	44mm (1.73 inches) x 217mm (8.54 inches) x 231mm (9.10 inches)
Weight	2.2 Kg (1 pound)

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